NGA

KNOW THE EARTH ... SHOW THE WAY ... UNDERSTAND THE WORLD.

# PATERDER

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# STRENGTH THROUGH COMMUNITY

- UNITY OF EFFORT
  Creating stability despite uncertainty
- 22 INTEROPERABILITY

  Managing the challenge of conflicting priorities
- PROFESSIONALIZATION
  Strengthening the workforce during rapid change

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**EDITOR'S MESSAGE** 

We provide GEOINT for our Nation's Security.







Clichés, while often groanworthy, nearly always start as profound observation. They become trite for the very reason that they make sense; otherwise, they would not be repeated to overuse.

Consider the well-known 'can't see the forest for the trees.' At its core is a warning that limited focus will not suffice; one must be able to consider the big picture in order to succeed.

That message resonates throughout the National Intelligence Council's "Global Trends: Paradox of Progress" released in January 2017. The report makes

it clear that nations must think broadly and face shared challenges together: "The number and complexity of issues beyond the scope of any one individual, community or state to address is increasing — and doing so at a seemingly faster pace than decades ago."

The nations that will thrive, according to the report, are those that "invest in the infrastructure, knowledge and relationships that allow them to manage shock — whether economic, environmental, societal or cyber."

That same thinking forms the rationale for functional management of the intelligence disciplines. Both individual stakeholders and the broader communities they form can maximize effectiveness by collaborating within a formal structure. That means collectively addressing challenges such as terrorism, natural disasters and disease outbreaks, to name but a few.

The Department of Defense established the director of the National Geospatial-Intelligence Agency as the functional manager of the GEOINT enterprise in May 2011. That means that in addition to his role as director of NGA, Robert Cardillo serves as the principal advisor to the director of national intelligence and the secretary of defense on GEOINT performance. As designated leader of the discipline, he must facilitate the integration of plans, policies, programs and standards that unify community efforts, not just NGA's.

This issue of NGA Pathfinder explores what it means to lead the GEOINT community. It's not about bureaucracy. Functional management determines the degree to which our national security agencies can share information during a terrorist event and how effectively we can coordinate with our allies during times of war. It enables search-and-rescue missions and contributes to the fight against diseases and drug-resistant superbugs.

These are all things that NGA does — but not in a vacuum. The agency is one of nearly 50 members comprising the National System for Geospatial Intelligence, or NSG. A broader Allied System for Geospatial Intelligence, or ASG, includes the NSG members plus America's closest allies, Great Britain, Australia, New Zealand and Canada.

The main features in this issue bring to light how the NSG gains strength through unity. The cover story illustrates the breadth of efforts. A second feature explores the move toward integration and interoperability among NSG members. A third examines how the National Geospatial-Intelligence College, headquartered at NGA Campus East, endeavors to develop professionalism through community training and certification.

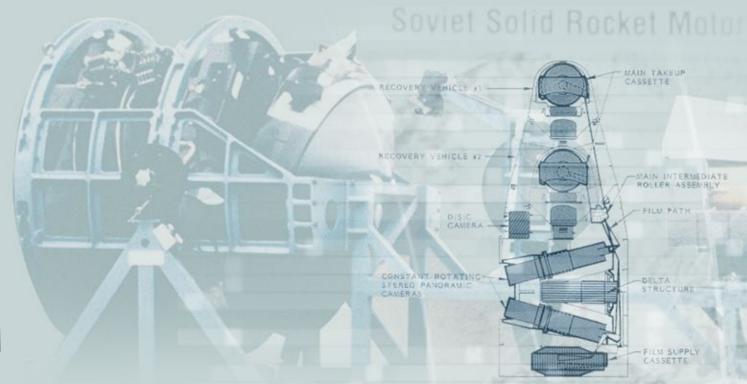
Other articles also illustrate the importance of big-picture collaboration. A commentary by partners in New York City discusses the interoperability of public utilities. Another article addresses employee collaboration to enhance professionalism.

The issue closes out with a look at how the ASG ensures that the GEOINT community maintains a global view. After all, we can only overcome universal challenges if we have a perspective broad enough to see them clearly.

Together we will succeed.

V/r,
Jeanne Chircop
Editor





# WHAT GOT US HERE:

NGA'S QUEST TO 'KNOW THE EARTH' LIKE NEVER BEFORE

By Nancy M. Rapavi, Office of Corporate Communications



The United States began using the U-2, a high-altitude reconnaissance aircraft, in 1956 to collect optical imagery over the Soviet Union and other denied regions. But within a few short years, vehement diplomatic objections by the Soviets and the downing of Francis Gary Powers' U-2 flight in May 1960 highlighted the significant risks and limitations associated with airborne collection over adversarial territory. U-2 flights over the Soviet Union were suspended.

The Eisenhower administration was well aware of the perils and pitfalls of airborne collection prior to the Powers incident and had been working to harness technical innovations to continue acquiring critical imagery by more secret means. By August 1960, Corona, the first U.S. space-based reconnaissance satellite, was acquiring imagery of the Soviet Union, the Chinese mainland and other areas of interest to the intelligence community. (See related story, page. 28.)

While collection from space represented a leap in technological innovation by itself — much like the aircraft method used to capture image capsules ejected from Corona — the fact that later Corona variants were equipped with sensors capable of collecting stereoscopic images facilitated advancements in image science, analysis and ultimately more detailed and informative products.

Today, National Geospatial-Intelligence Agency's analytic modernization efforts are leveraging key advancements in sensor technology, image exploitation techniques and correspondingly, geospatial science disciplines to improve tradecraft and provide enhanced products and services to a growing customer base.

Among the latest tradecraft innovations are the object-based GEOINT approach and activity-based intelligence, which enable analysts to move well beyond a snapshot of time in layered analysis, to a narrative that can be continually updated from multiple sources and GEOINT disciplines. From bathymetry

and geodesy to big data, innovations in GEOINT tradecraft are helping analysts 'know the earth' like never before.

James Ford, chief of NGA's bathymetry branch within the maritime safety office, said NGA can perform sophisticated depth analysis in water of less than 20 meters — using multispectral imagery and radar — with innovative tools such as the littoral bathymetry toolkit and the River Eye Current Retrieval, or RECR.

"NGA developed these tools and is working on others to improve our ability to collect shallow water data," Ford said.

The tools are constrained by environmental factors such as clouds, water clarity, sun angle and wave fetch, and don't always meet the 'safe for navigation' standard, Ford said, but they can be used to estimate conditions in denied or restricted areas.

"For uncharted areas, innovative tools like the LBT and RECR present methods that help obtain necessary information for missions such as route planning and sensor placement," said Ford.

Another example of tradecraft innovation is in the geodetic field, where modern geodetic survey techniques rely heavily on cuttingedge tradecraft. Surveying equipment, techniques and tradecraft are constantly updated in order to create more accurate outcomes.

Take the World Geodetic System 1984, or WGS 84, as an example. The system is the Department of Defense standard for mapping, charting, positioning and navigation. NGA's geodesists regularly update this system to ensure reference coordinates reflect the most recent data and changes to the Earth's surface and center.

"WGS 84 may sound like an old system, but the great thing about WGS 84 is that it is a system of systems," said James Friederich, a senior GEOINT officer in NGA's Office of Geomatics. "Rather than one big thing, it is made up of pieces and parts that are basically interrelated to each other in some way."

And those pieces have their own adjustments — from mid-term updates that reflect the earth's dynamic geophysical process to short term updates that provide a daily 3 centimeter update of the position of the spin axis of the earth.

Friederich said that other innovations in the realm of geodetic survey equipment include systems that gather magnetic data to help NGA build models of the earth's magnetic field. The results will be used by navigation systems in aircraft, ship and on land.

"NGA is leading the way for the DoD and the international scientific community on recognizing the potential shortfall for measuring the earth's magnetic field," Friederich said.

While the world of tradecraft innovation will always be asking for the "what's next?" there is significant senior leadership interest when it comes to developing innovative approaches to further enhance tradecraft.

"We are moving from a factory-like approach to a data-centric, customercentric and analyst-centric approach," said NGA's director of analysis, Sue Kalweit, as she described analytic modernization, or AMOD, during a recent NGAmeeting. "Analysts are working across the NGA enterprise team, across the enterprise, across the NSG-ASG [National System for Geospatial Intelligence and Allied System for Geospatial Intelligence] and industry."

AMOD's way forward includes redefining relationships with partners and customers by emphasizing innovative approaches to analysis, collaboration and dissemination.

"Don't go at it alone," Kalweit said. It's a message often echoed by NGA Director Robert Cardillo.

"What got us here won't get us there," Cardillo has said many times as a reminder that teamwork, innovation and new ways of thinking are constantly needed to respond to a changing national security environment.

With a new analytic roadmap and AMOD leading the way, NGA continues its journey toward the future.



Young Doug Bugeaud always believed he could make a mark on the world, even if he didn't know exactly how or where he would do it.

"I joined the military because I was one of those silly guys who came to save the world," said the Canadian Army major. "You hear jokes about people doing that, but I wanted to make the world a better place for everyone who didn't have the advantages that some of us do have."

Thirty-five years later he is still helping people including the American and Commonwealth partners he currently works alongside as one of the Canadian Forces intelligence liaison officers serving at the National Geospatial-Intelligence Agency.

He's also seen a good amount of the world in the process. Born in Montreal but raised in western Canada, Bugeaud joined the Canadian Forces in

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1982. He has since lived in Cambodia and Florida, among other places, and now resides just outside the U.S. capital. Speaking from his post inside NGA's Springfield, Virginia, campus, Bugeaud said he couldn't be more honored by his current duty.

"We [United States and Canada] have a long history of working together very well. Our mindset is close enough that we can work together, quite successfully, to whatever the aim or

particular mission." said Bugeaud. "It's really an honor to have been chosen to come serve here."

Before landing at NGA, Bugeaud's military career took him from infanteer to intelligence officer to international liaison. It also took him to the other side of the world.

Bugeaud deployed to Cambodia as a mission expert, where he was the operations adviser. He commanded a group of 16 platoons of de-miners as part of an organization comprising of foreign military advisers and 15,000 Cambodians de-miners. He simultaneously served in senior military intelligence and operations roles, where he gained expertise to specialize in the intelligence field.

Bugeaud became an intelligence officer in 1997 after 14 years in infantry. While stationed back in Ottawa, Bugeaud learned the specialized geospatial intelligence tradecraft. The city is home to the Canadian Forces Intelligence Command, where components provide imagery and imagery intelligence, and geospatial information and geomatics, to support Canada's national security objectives.

Bugeaud also deployed to U.S. Central Command headquarters in Florida during his military tenure, where he served as the Canadian Forces intelligence liaison officer. He continues his liaison duties at NGA, where he serves as the operations officer for the Canadian Forces liaison team and NGA Commonwealth partners. That requires him to represent the team in NGA activities that are operations oriented.

"I keep Canada informed of what's going on in the States and the States informed of what's going on in Canada," Bugeaud said.

Canadian Army Lt. Col. Kevin Ng, Bugeaud's supervisor, described the operations officer as an asset to any team he joins.

"Doug Bugeaud is a well-rounded, go-to GEOINT guy, who is equally as comfortable leading an infantry attack

> as he is developing a strategic analysis model," said Ng.

Bugeaud credits good teamwork and communication as keys to achieving success as a Commonwealth liaison at NGA.

"A large part of my job is being a funnel — a conduit for information to get to the right person or get the right people talking," said Bugeaud. "At NGA I'm constantly meeting with Commonwealth partners to ensure we work together on operational matters.'

collaborated with a completely

different kind of partner-his Shepherd dogs. In Canada he was a trainer in dog agility competitions, instructing and leading his dogs through timed obstacle courses. Now in his third tour in the United States, he enjoys spending time with his closest partners — his family.

Bugeaud will celebrate his country's sesquicentennial anniversary this year while serving away from his Canadian home. But just as he dreamed of in the days of his youth, he is still making a positive mark on the world.

Off the job Bugeaud has

Know a service member worthy of an NGA Salute? Send your suggestion to Pathfinder@nga.mil.



Dustin Gard-Weiss brings a different perspective to geospatial intelligence functional management just by being at the National Geospatial-Intelligence Agency.

Currently on a joint-duty assignment from the Chief of Naval Operations, Gard-Weiss is the first member of the National System for Geospatial Intelligence — NSG — to serve as associate director for functional management. As such, he is responsible for executing the functional management mission on behalf of the GEOINT functional manager, NGA Director Robert Cardillo.

During Gard-Weiss' years with the Navy, he served on the NSG Senior Management Council, the governing body of the NSG; the Navy GEOINT Office was a part of his staff. At NGA, he chairs the National Geospatial Intelligence Committee, or GEOCOM, and also directs the NGA GEOINT Enterprise Office, the only office at the agency devoted to supporting the director's functional management responsibilities.

#### **CHANGING HOW WE THINK**

The NSG is evolving how it executes the mission, according to Gard-Weiss.

"If we just thought 'community first' in everything we did, it may not change what the outcome was; but it will change how we do business, how we interact with each other and across our GEOINT enterprise," he said.

Separate from Cardillo's role as functional manager, NGA, as the NSG member with the deepest geospatial intelligence expertise, has the chance to play an ever-increasing leadership role within the enterprise — to help set GEOINT standards; develop tradecraft and training; and contribute to the creation of the systems needed for information-sharing among all NSG partners and beyond.

"Ultimately I see a world where we are far more integrated, far more dependent upon one another," said Gard-Weiss.

Building a more cohesive and interoperable GEOINT enterprise will take more than new ways of thinking, however; it also requires member buyin, creative partnering and strong leadership. At Cardillo's direction, Gard-Weiss intends to use NGA's GEOINT Enterprise Office as the leadership change catalyst. He also stood up a partner engagement division within his office to look at partnerships specifically through a functional management lens.

#### **UNDERSTANDING IT'S NOT A MONOPOLY**

"We have to consider that this is not just a U.S. government game anymore," said Gard-Weiss.

He says the first step is to take a look at the NSG member relationships and make sure all needs and capabilities are understood and that relationships

are true partnerships, not just a provision of goods and services. Understanding the capabilities that enterprise members bring to bear will allow a paradigm shift in how business is conducted. This understanding will enable the enterprise to "marry" the capabilities of one organization with the mission needs of another, according to Gard-Weiss. Sharing expertise across the community strengthens the enterprise and reduces duplication.

Gard-Weiss cautions that what's needed for this "interdependency is the knowledge that the intelligence is reliable; that [it] meets the standards set by, and for, the enterprise." He said analysts must have the same training and certifications, and a standardized tradecraft in place so as "to have confidence in the work being done across the enterprise."

#### WIDENING THE PARTNERSHIP CIRCLE

The Department of Defense defines the NSG as including not just government, but also industry and academic partners; several international allies are considered associate members. Gard-Weiss believes a necessary step in strengthening the enterprise is to evolve these commercial, academic and international partnerships.

For instance, we need to harness the innovation taking place in industry and apply it across the enterprise in ways that we have not been done before, said Gard-Weiss. To do that he is exploring what an enterprise-level relationship with industry might look like, including the possibility of facilitating enterprise-level licenses.

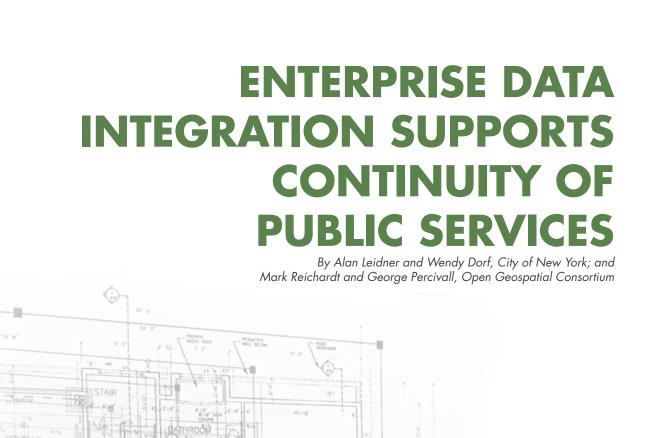
Ultimately Gard-Weiss wants to ensure that if "one member is leveraging a commercial capability or technology" for their mission needs then a) the broader enterprise is aware, and b) the other enterprise members get to share in that capability as well. In the same vein, enterprise leadership needs to think holistically about the best investments for the enterprise.

He also supports partnering with academic institutions that are teaching geographic information systems and intelligence analysis skills at both the undergraduate and graduate levels.

How do we "leverage that brain power" and "how do we harness that time they [students] are spending in class?" asks Gard-Weiss. He even considers how "could we federate some production responsibility with an academic institution, where that class is responsible for 'x' in an unclassified way?"

Next is to rethink international partnership.

"Think about the commercial and governmental capabilities that are being developed around the world, beyond our traditional circle of Commonwealth partner nations," said Gard-Weiss. Expanding that circle is on his to-do list.



VIEWPOINT

Editor's note: The views expressed in this article are those of the author and do not reflect the official policy or position of the National Geospatial-Intelligence Agency, the intelligence community, the Department of Defense or the United States Government.

Since the development of enterprise geospatial information systems in the 1990s, the idea of accurately depicting underground infrastructure has been on the minds of many GIS directors across the United States. New York City planners were among those who anticipated significant benefit from the integration of enterprise data.

Efforts ebbed and flowed during the early years, until the 9/11 attack on the World Trade Center proved the need for integrated utility information. It took more than 10 days after the disaster to assemble utility data for the affected area and register it to the city's base map, due to different formats ranging from digital maps to paper drawings. A decade later Hurricane Sandy reinforced that a lack of comprehensive and integrated infrastructure information contributed to a lessthan-full understanding of the storm's damage.

The Open Geospatial Consortium is now working to develop underground infrastructure interoperability standards that will shape how information is organized and integrated about the infrastructure networks that support cities, counties and other municipalities across the United States and around the world. Expected benefits range from improvements in day-to-day management of street openings and construction projects, to more effective large-scale planning and emergency response.

Springing from a conversation between Mark Reichardt, OGC president, and Alan Leidner, director of the Center for Geospatial Innovation of the Fund for the City of New York, the project has grown to international proportions. Sponsors for the first phase of the project include the Ordnance Survey of Great Britain and the Singapore Land Authority in addition to the Fund for the City of New York, under the leadership of Mary McCormick, Ph.D. Project participants expect that dozens of cities and urban-related organizations around the world will follow the initiative's progress, hopefully even contributing to it.

#### **EARLY EFFORTS**

Even before GIS gained widespread attention, the Department of City Planning led the New York City GIS effort in the 1980s by creating a street centerline, a parcel layer and a geocoding engine. In the late 1980s the city's Department of Environmental Protection, which had adopted a computer-aided design and drafting platform, began building a seamless water main layer. Under Wendy Dorf's management, the effort encompassed NYC's entire 6,000-mile water and sewer system. In a related effort, DEP's upstate sources division, which manages the city's water supply, also

developed a GIS system that encompassed its entire network of streams, reservoirs, lands and aqueducts.

From 1995 to 1999 New York City, with funding from DEP, developed its photogrammetric base map and began registering all the GIS layers created prior to the newest, most accurate map. Soon thereafter DEP's Bureau of Sewers embarked on an effort to create a seamless digital map of its sewer system in a way that would enable the water and sewer layers to be viewed together.

A GIS coordination office located in the NYC Department of Information Technology and Telecommunications, working with the Department of Transportation and the Law Department, then sought to have the city's private utilities develop electric, gas, steam and telecommunications layers registered to the accurate base map. An agreement with NYC's electric utility, based on provisions of the city's franchise agreement, was close to being signed when the terrorist attack on the World Trade Center took place.

#### 9/11 EFFECTS

The 9/11 attack revealed both the necessity and risk of integrating infrastructure data. DEP formed an Emergency Mapping and Data Center to respond to the disaster, with Leidner at the helm and Dorf in charge of organizing a 'deep infrastructure group' whose mission was to collect, inventory and integrate all infrastructure information for the area beneath and adjoining the Trade Center complex. It took more than 10 days to assemble and register the data to the city's base map due to its widely varying formats. The effort proved essential, however; it delivered critical information to the response community, including the location of a 22,000-gallon tank of compressed Freon located beneath the WTC.

While this work revealed how important it was to have uniform digital data for all infrastructure layers to support rapid integration and analysis during a disaster, it also provided a rationale for infrastructure owners to lock down their data due to security concerns. For 15 years following 9/11, there was no further movement in NYC to integrate private and public utility data.

While NYC efforts stagnated, those at the federal level gained momentum. The U.S. Geological Survey, National Geospatial-Intelligence Agency and the Department of Homeland Security recognized the need to identify the locations of critical infrastructure. The agencies collaborated to link infrastructure managers from across the nation

through a secure computer system that provided access to hundreds of layers of integrated infrastructure information. Through an application called OneView, users could see relationships between different infrastructure networks that had never been understood before. OneView proved that infrastructure data from many sources could be standardized, integrated and used for a wide variety of analytical and operational support uses — all without compromising security.

#### **HURRICANE SANDY**

New York experienced another chapter in GIS development in 2012, when Hurricane Sandy made landfall near Atlantic City and caused the largest storm surge ever experienced in nearby New York harbor. Subway and vehicular tunnels flooded, wastewater treatment plants were damaged and coastal communities suffered devastating fires caused by electrical short-circuits as salt water came into contact with exposed circuitry.

Perhaps most emblematic of the disaster was the flooding of the East 13th Street electric substation and the ensuing blackout of Manhattan south of 34th Street. The blackout led to a series of cascading effects that included the failure of backup generators and the evacuation of the New York University Medical Center and Bellevue Hospital along the East River.

Many in the New York GIS community understood that the lack of comprehensive and integrated infrastructure information had contributed to a less-than-full understanding of the potential damage that could be caused by a storm like Sandy. Impacts on public services were severe.

#### **NEW SOLUTIONS**

New York's GIS efforts gained momentum when city planners reached out to the Open Geospatial Consortium in 2014 to develop an infrastructure data development and integration program for the city. OGC serves as a global forum for developers and users of spatial data information and services, and develops open international standards for geospatial interoperability. With the help of OGC's chief technology officer, George Percivall, and a \$25,000 grant from the Fund for the City of New York, the OGC Underground Infrastructure Interoperability Standards Project was launched.

Percivall and his OGC colleagues quickly identified several existing and complementary standards and compliant implementations that could meet New York's needs. OGC standards for aboveground infrastructure were already mature and operational; however, the city's need for underground infrastructure maps and models would require development of new standards.

#### ABOVEGROUND MODEL

OGC members had previously applied the OGC CityGML standards to model aboveground infrastructure. For the new project, a team from Germany's Technische Universität München used a combination of software to create and publish a virtual 3-D model of New York City.

The city model is based exclusively on open data from the official Open Data Portal of NYC. Twenty-six different datasets, totaling four million 2-D and 2.5-D geospatial data objects, were integrated to create the 3-D model via a fully automated process developed by TUM. The total data size is around 1.6 terabytes of XML data — around 80 gigabytes compressed — including more than 1 million building models, 150,000 streets and more than 860,000 land parcels.

#### **BELOWGROUND DEVELOPMENTS**

While OGC standards are in operational use for aboveground mapping and modeling, there are technical and community challenges involved in setting consensus standards for belowground modeling. Several OGC working groups are considering how to address belowground models by extending existing standards such as OGC CityGML and OGC land and infrastructure standards.

Research both within the OGC context and more broadly is developing approaches to underground infrastructure modeling. The OGC Underground Infrastructure Concept Development Study is the first step in a multi-part OGC initiative to address the NYC underground infrastructure needs. The CDS will help develop and document an in-depth understanding of all the components necessary to enable standards-based infrastructure data interoperability in an underground environment.

During 2016, OGC coordination enabled professors from the Delft University of Technology — the largest and oldest Dutch public technological university — to conduct research in conjunction with Columbia University on the NYC underground requirements. At the suggestion of a Columbia professor, future plans call for the addition of data for underground soil conditions, including bedrock, soil type, water table, moisture levels and foundations.

#### LEVERAGING INNOVATION

The CDS focuses on underground interoperability requirements in the NYC urban landscape, but its research can extend to broader regions. Because of commonalities with efforts planned by the Ordnance Survey of Great Britain and the Singapore Land Authority, those entities joined the Fund for New York City in sponsoring the CDS phase.

To support the CDS, OGC recently released a request for Information; responses will inform the final CDS report, which will include a full set of use cases, architectural options, promising technologies and other relevant

information. The CDS will in turn define the scope for subsequent steps of a multi-phase underground infrastructure interoperability initiative able to develop and demonstrate the value of common information standards and practices.

For both NYC and OGC, the ultimate goal of the effort is to ensure that cities, states and municipalities have reliable and integrated geospatial data, standardized information and practices they need to most safely ensure continuity of services for their customers.

Alan Leidner and Wendy Dorf are veterans of the GIS response to 9/11 and have been engaged in GIS programs in New York City for more than two decades. Leidner serves as director of the Center for Geospatial Innovation of the Fund for the City of New York; Dorf is currently director of New York Geospatial Catalysts.

Mark Reichardt and George Percivall, of the Open Geospatial Consortium, are senior leaders of the OGC Innovation Program, which uses a multistep collaborative methodology for interoperability initiatives. Reichardt serves as OGC president; Percivall is the consortium's chief technology officer. To comment on the collaboration between NYC and OGC, contact Leidner at aleidner@fcny.org or Reichardt at mreichardt@opengeospatial.org.





NIC publishes a global trends report every four years to help intelligence professionals and national decision-makers understand the currents shaping the global landscape in the distant future; this edition forecasts trends through 2035. In stressing the dichotomy of progress, the 2017 report helps intelligence professionals and national decision-makers anticipate the most likely implications for specific disciplines and missions, including geospatial intelligence, or GEOINT.

Consider for instance how commercial sensor, satellite and information technologies have led to exponential growth of georeferenced data that anyone with a smart phone can access to keep up with events and ease everyday tasks. The Center for Global Enterprise estimates that about 3.4 billion people around the world use the internet and 2.2 billion people use social media. Ninety percent of the digital data currently available has been produced in the past two years; the total volume of digital data is projected to be 50 times bigger in 2020 than what existed in 2010.

While more data leads to deeper insight, this explosive growth makes it harder for intelligence professionals to know which data stream to mine first and how to extract the most valuable nuggets of information. To overcome the paradox of big data, the GEOINT community has made interoperability a priority, i.e., empowering intelligence professionals to readily discover and share GEOINT content from all sources for use by common exploitation and analytic tools.

Automating collection and exploitation tasks is an impetus for interoperability, according to National Geospatial-Intelligence Agency Director and GEOINT Functional Manager Robert Cardillo.

"The solution to key intelligence questions lies in maximizing the integration of all available GEOINT sources. Automation enables our analysts to be interpreters, to find the meaning behind the data," he said.

Automation is an efficiency that is equally important when data is scarce. Imagine the difficulty of monitoring threats and hot spots in an expansive region such as sub-Saharan Africa without automation and its capacity for broad-based change detection.

"I'd much rather our analysts spend energy on developing mental models of Boko Haram, sectarianism and resource scarcity, rather than rescanning imagery every day," Cardillo said.

Additionally, standardizing facets of interoperability — i.e., developing, applying and enforcing common standards across the entire community — creates an open and dynamically updating, multi-domain architecture capable of delivering foundational geospatial content to all authorized users and thus facilitates the transformation of geospatial information into valuable intelligence.

#### **DIVERSITY OF CONTRIBUTORS**

The widespread availability of geospatial information and analytics has created new opportunities not only within industry, but also for educators, journalists, policy advocates and practitioners. The application of geospatial technology to uncover and prevent human rights violations is one example.



National GEOINT Committee NGA Director Robert Cardillo (right) serves as functional manager for the GEOINT enterprise. Dustin Gard-Weiss (left), director of the NGA GEOINT Enterprise Office, supports Cardillo by serving as both associate director for functional management and chair of the GEOCOM.

#### A STRUCTURE FOR COLLABORATION

- FRAMEWORK The National System for Geospatial Intelligence, or NSG, is the operating framework for collaboration among GEOINT producers, consumers and influencers.
- WHAT IT DOES The NSG advances the GEOINT function by facilitating community strategy, policy, governance, standards and requirements to ensure responsive, integrated national security, humanitarian and related civilian security capabilities.
- MEMBERS GEOINT components of the intelligence community, military departments, joint staff, combatant commands and other U.S. government departments and agencies form the core of the NSG and are referred to as the NSG community.
- WIDER COMMUNITY NSG members regularly collaborate with America's closest allies — Great Britain, Australia, New Zealand and Canada — in an operational structure known as the Allied System for Geospatial Intelligence. At times, the NSG community may form partnerships with additional organizations to accomplish a specific GEOINT mission. These broader community partnerships constitute the GEOINT enterprise.
- LEADERSHIP By executive order implemented through
  Department of Defense and intelligence community directives,
  the director of the National Geospatial-Intelligence Agency
  serves as the functional manager for the GEOINT discipline;
  this responsibility is distinct from leadership of NGA.
- HOW IT WORKS NSG work is conducted through the National GEOINT Committee, or GEOCOM, which is supported by NGA and chaired by an associate director for functional management. Through the GEOCOM, NSG members establish enterprise priorities, goals, objectives and performance measures. They identify best practices and areas for improvement, and develop integrated approaches for advancing the GEOINT mission. They also marshal and invest resources to optimize the value returned to community stakeholders. Senior members of the GEOCOM form the highest decision-making body for the NSG — the NSG Senior Management Council.

"Nearly ubiquitous internet-enabled mobile telephony with cameras means that bystanders and victims of human rights abuses can collect and disseminate information and images in real-time," according to a panel of experts who spoke at a November 2016 symposium convened by Harvard Kenedy School's Carr Center for Human Rights Policy.

The challenge, as reported in the event's conference report, "Human Rights & Technology in the 21st Century," is finding a way to authenticate and manage the vast amounts of data available from different sources.

Welcoming new participants, especially from the open-source community, into the GEOINT enterprise is not without risk for those charged with advising decisionmakers on courses of action. Whereas each contributor offers a particular and unique account of an event, decision-makers need a complete story that hangs together and rings true. Collaborative storytelling — the generation of dynamic mission threads that keep decisions actionable — runs on trust and confidence, not only in the storytellers themselves, but also in the sensor models, the processingbased algorithms, and the tools and techniques used to analyze the data.

"Collaborative if not simultaneous editing and review of products from multiple authors, each bringing their unique perspective and expertise to the problem, enriches the intelligence we produce," said Joseph Fontanella, Ph.D., co-chair of the National GEOINT Committee's analysis and production subcommittee.

NSG Mission Manager Jeffrey Reinier likewise sees a connection between professionalization and trusted products.

"Policymakers are less concerned about whose seal is on a product, so long as that product is accurate," said Reinier. "The goal is to move the right data to the right people at the right time, regardless of whether that product comes from a theater or national partner."

As more GEOINT professionals train and perform to a core set of

standards, the greater the potential for shared use. That is why the GEOINT community lists interoperability and professionalization among its top three priorities: Interoperability aids data discovery; professionalization ensures its proper and authoritative use.

"Enterprise-wide professionalization and certification programs better enable us to share production workloads and focus collection and exploitation during surge and crisis operations," said Fontanella.

Certification is a formal, standardsbased process of training and testing that enables people to demonstrate competencies in GEOINT tradecraft, according to Collin Agee, co-chair of the National GEOINT Committee's training and professional development subcommittee.

"Certification generates selfconfidence, confidence in others, and confidence in community products, ensuring that GEOINT professionals keep pace with state-of-the art tools and tradecraft," said Agee.

#### **UNITY OF EFFORT**

The implications of an expanding GEOINT enterprise, as measured by the diversity of its sources, the plurality of its contributors and the reach of its influence, fit the "paradox of progress" described in the "Global Trends" report. It is reasonable to ponder whether the GEOINT community should heed the report authors' warning of polarization and hardening divides that often occur during periods of rapid expansion. NSG members have considered this question and affirmed their commitment to establishing a unified GEOINT enterprise.

The NSG statement of principles, issued in 2016, conveys what it means to be a community member: to create an environment of trust and accountability; to partner strategically to advance the enterprise; and to use a common framework that develops actionable needs.

"Members of the GEOINT enterprise are committed to understanding and embracing each other's unique capabilities and contributions," said Dustin Gard-Weiss, associate director for functional management and director of the NGA GEOINT Enterprise Office. "We find strength in community — working toward an interoperable enterprise in which differing mission areas and interests are fully integrated."

Unity of effort completes the triad of GEOINT community priorities. Compared with interoperability and professionalization, unity of effort best expresses the functional manager's responsibility to sustain a cohesive community through a period of rapid expansion.

Michael Hayden, former director of both the Central Intelligence Agency and National Security Agency, discussed unity of effort in May 2011 testimony delivered before the Senate Homeland Security and Governmental Affairs committee.

In contributing to the committee members' assessment of post-9/11 intelligence reform, Hayden said, "Congress chose ... to recalibrate for the intelligence community the critical balance that any complex organization needs: the balance between freedom of action for the parts and the unity of effort for the whole. Too little autonomy for the parts leads to inaction, inflexibility, hesitation and lost opportunities.

Too little unity of effort means that individual excellence is not synchronized, harmonized, exploited or leveraged."

Finding and sustaining that balance is no small feat. Gard-Weiss believes that it begins with a change in attitude.

"Instead of ledgering what we as individuals spend and receive in return, unity of effort takes a community-first stance," he said.

#### **UNDERSTANDING OF NEEDS**

Achieving unity of effort requires an understanding of members' needs and unique capabilities, according to Gard-Weiss. Also needed are: synchronized mission management to efficiently apply community contributions, resources and activities; repeatable metrics to assess performance; and a network of open, collaborative

partnerships. Each of these aims advances unity of effort by changing the conversation with community members and promoting a change in perspective.

As GEOINT functional manager, Cardillo recently issued a statement of GEOINT needs intended to change the conversation about current and future capabilities.

"The statement is an initial attempt to capture and represent needs holistically, as an enterprise, from a mission perspective," said Chris Sullivan, chief of the Future Needs branch within the NGA GEOINT Enterprise Office. Sullivan led many of the community engagements that resulted in the composite list.

Within the list, integration, collection, characterization, automation and anticipatory analysis figure prominently in how enterprise members convey high-confidence, anticipatory intelligence to their partners and customers. Also at stake are remote-sensing architecture decisions, integration of commercial and foreign partners' data, and advanced analytics in enterprise capabilities. Paramount is the ability to outmaneuver foreign adversaries.

"It's about putting aside your personal links to the mission that you are working, to think about the mission of the whole organization or even the whole enterprise," said Zoë Jenkins, a senior analyst with the Australian Geospatial-Intelligence Organisation.

#### **COMMITMENT TO CHANGE**

Reflecting on the "Global Trends" report, Gard-Weiss said that "the things we anticipated four or five years ago are coming to fruition in ways we did not expect -- and requiring us to work together in different ways."

Strategic partnerships pool and diffuse knowledge, with cascading benefits for members of the enterprise. They produce results beyond what any member can achieve on its own. Functional management provides the authorities and structures to change the space in which individual agencies and analysts perform, to work seamlessly with partners inside and outside of government, at home and abroad. With this change in perspective, NSG members, in partnership with key international partners, will create, curate and produce more customized and anticipatory intelligence.

Even with a broadened, community-first perspective, organizational and policy limitations remain, especially when managing the mission across and between GEOINT data environments and organizational boundaries. Enterprise members are working to overcome these limitations by integrating activities and data with others within the defense and intelligence communities, and international, academic and industry partners.

GEOINT community members are committed to understanding and embracing each other's unique capabilities and contributions. Together, they are demonstrating how to define problems, invest resources, execute missions and address challenges as an enterprise.

# DEMONSTRATING THE CAPACITY TO INNOVATE

The Multi-Agency Collaboration Environment, a government-industry partnership, is dedicated to enabling an enterprise culture of information sharing. MACE partnerships demonstrate global interest in the assessment of commercial and open-source geospatial data and analytics.

MACE evolved from a communitywide conversation about the capabilities of new commercial small-sat constellations and their potential for the Intelligence Surveillance and Reconnaissance system of systems. Catalytic funding from NGA, through its GEOINT enterprise investment program, has enabled MACE to conduct a series of analytic exercises, known as sprints, to develop an initial concept of operations for the GEOINT community. Private industry conducts the sprints, with government sponsors including NGA, the National Reconnaissance Office, the Defense Advanced Research and Development Agency, Department of Homeland Security and the U.S. Army, as well as Commonwealth partners and other foreign allies.

Four sprints conducted in 2016 addressed humanitarian assistance needs and scenarios involving the monitoring of adversaries' mobile systems. Each sprint layered in new sources and phenomenologies, beginning with commercial electro-optical imagery and automatic identification systems, and later encompassing commercial synthetic aperture radar and hyperspectral imagery.

"MACE demonstrates that the GEOINT enterprise has the capacity to innovate, and the means to organically create a suite of capabilities that holistically address a mission-related need," said Joseph Rouge, MACE champion and co-chair of the National GEOINT Committee's collection subcommittee.

The sprints enabled geospatial analysts to test, select and execute the most effective collection and exploitation strategy for enduring missions. They also addressed policy issues, such as privacy and operational security, and enabled multinational and industry partnering through innovative contracting. Collectively the sprints facilitated the development of a commercial GEOINT concept of operation for the enterprise.

# EXCHANGING A WEALTH OF KNOWLEDGE ON THE ROAD TO GREATER PROFESSIONALISM

By Marlene Weeks, NGA Professionals Network, Communications Team

Collaboration is the new 'currency' of our business, both within the National Geospatial-Intelligence Agency and the larger National System for Geospatial Intelligence. It requires an initial investment of time, energy and expertise, but those who collaborate with colleagues realize a valuable return. Partners enjoy the benefits of shared knowledge, resources and networks; improved efficiency; and even economy of scale.

At NGA, one group that banks on building positive relationships is the NGA Professionals Network, an organization that for more than 13 years has provided professional development, networking and mentoring opportunities for the agency's workforce. The intrinsic value of the group is that it was formed and continues to be managed by employees to serve other employees and each other in the bid for greater professionalism.

NPN's membership comprises a diverse group of more than 1,000 employees from across NGA. whose members voluntarily commit to developing and demonstrating leadership skills. They work to improve the careers and professional experience of the NGA workforce by promoting a full spectrum of horizontal and vertical networking opportunities and strengthening organizational ties to mission. The organization serves as a forum in which to voice concerns, exchange ideas and address workplace issues. Above all, the NPN provides a vehicle for increasing collaboration and cohesion by building professional relationships with colleagues

throughout the intelligence community, not just within NGA.

#### TALKS, WORKSHOPS AND MENTORING

NPN organizes a range of events and programs for the benefit of its members. Initiatives include NGA Education and Development (NED) Talks, fashioned after the private-sector TED Talks, and NED Books, which are speakerled discussions around professional development books that group leaders identify as being of potential interest and benefit to NPN members.

When possible, NPN members plan activities to coincide with other events. For instance, in support of Women's History Month in March, the group hosted a NED Books session focusing on the book "Presence: Bringing Your Boldest Self to Your Biggest Challenges," by Amy Cuddy. With a panel of speakers to lead the discussion, the session was open to the entire workforce, not just to NPN members.

NPN hosts an annual Interagency Mentoring and Collaboration Workshop as its flagship event. This year's IMCW was held in January in honor of National Mentoring Month. The event featured a series of speed-mentoring sessions to spark mentoring partnerships.

Another element new to IMCW in 2017 has been the participation of other NGA professional organizations and affinity groups. At the direction of its chairman, Britany L. Reid, NPN offered each of these organizations a station at the event where their representatives could meet with workshop attendees, distribute brochures and other materials, and discuss the services and benefits

they offer. In exchange, the participating groups informed their members of the partnership and promoted the work to them. This arrangement benefitted all entities involved by offering them exposure to a larger network of prospective members, and IMCW attendees learned about services and opportunities available to them via a variety of NGA organizations.

#### **BROADER COLLABORATION**

The mentoring workshop is but one of many forums through which individuals, offices, organizations and agencies can build collaboration capital in the IC. Another is the annual IC Collaboration Summit that took place at NGA Campus East in March. This exchange "for the community, by the community," as it was promoted, is part of a grassroots movement to encourage and support collaboration across the IC enterprise.

The annual summit focuses on tools, methods and best practices across the community. Personnel participate from agencies such as the Defense Intelligence Agency, National Security Agency and NGA. Many members of the NPN consider it a natural extension of their NGA-centric professional development to participate in the wider community event.

NGA employees who participate in either IC-wide or NPN-focused events and programs believe they profit from the professional partnerships they cultivate by doing so. By networking, exchanging information, sharing best practices and supporting one another's initiatives, they are amassing a store of rich knowledge and priceless support for their future success.





# NGA SHOWS THE WAY: NAVIGATING THE PAST, FLYING THE FUTURE

By Melanie Pittaluga, Aeronautical Navigation Office

The world watched in dismay as tragedy mounted in Somalia in 1992. Lacking any effective centralized government and plagued by drought and territorial chaos among clans and various warlord-controlled factions, Somalia faced a dire situation marked by starvation, violence and death.

As the death toll increased, the international community responded by forming the United Nations Operation in Somalia, or UNOSOM, to provide humanitarian aid and help pacify tensions in the region. UNOSOM created a united task force six months later to spearhead a second phase of action,

known as Operation Restore Hope, due largely to regional instability that limited success of the humanitarian efforts. This phase provided direct military support to ensure that a secure environment existed for the safe distribution of incoming aid. Once Operation Restore Hope established a suitable framework for secure operations, the mission transitioned to a more permanent peacekeeping force, coined UNOSOM II.

The United States, in support of the U.N., sent troops to assist relief efforts during each phase of the mission. Those efforts are summarized by Kenneth Allard in the government-sponsored

"Somalia Operations: Lessons Learned" published by The Institute for National Strategic Studies.

#### **FLYING THE MISSION**

Chris Ring, a current National Geospatial-Intelligence Agency employee, served in the Somalian humanitarian aid effort and provided mission impact as a C-130 flight navigator in the U.S. Marine Corps. Twenty-five years later he still emphasizes the essential role that aeronautical products produced by NGA's predecessor agencies played in ensuring aviation safety and mission accomplishment.



Ring deployed three times as a flight navigator during the Somalian crisis, twice during Operation Restore Hope and once under UNOSOM II. Stationed in Mombasa, Kenya, Ring and his crew flew daily missions to deliver humanitarian aid and provide logistics support to the military operations. Due to lack of infrastructure and governmental oversight, positive air traffic control and coordination were extremely limited.

The only area in Somalia that had any form of controlled airspace, according to Ring, was the immediate airport environment surrounding Mogadishu, which was managed by U.S. Air Force air traffic controllers. Most relief sorties were conducted in the uncontrolled airspace of the Mogadishu Flight Information Region, however; roughly encompassing the territorial boundaries of Somalia.

The advanced flight management systems and global positioning system technologies of today were not widely implemented in Department of Defense aircraft at that time; aerial navigation rested solely on flight navigators like Ring, who used flight information publication — FLIP — products provided by the Defense Mapping Agency. FLIP products support all phases of flight, from mission planning to en-route operations, and are updated routinely to ensure accuracy. DMA was one of the agencies that would form the

National Imagery and Mapping Agency in 1996 and later become NGA in 2004.

In Somalia, due to the specific mission needs of the U.N. operation, the uncontrolled nature of the airspace and the predominant use of dirt runways, Ring relied on a regionally specific loose-leaf booklet for navigation. This specialized FLIP product provided airfield data, visual landing procedures for softsurface airstrips and special handling procedures for position reporting in uncontrolled airspace.

"While flying 14-plus hour missions in uncontrolled airspace, the loose-leaf product was our only lifeline for navigating from point to point and ensuring collision avoidance, where aircraft separation was accomplished via inter-plane radio coordination between hundreds of flights daily," Ring said.

Ring recalls one specific mission made possible by this DMA product during his second deployment. A U.S Air Force AC-130 gunship was conducting weapon-systems testing off the coast of Somalia during Operation Restore Hope. A malfunction caused an explosion and uncontrollable fire during flight, which caused the aircraft to crash into the Indian Ocean one mile off the shore. Fourteen crew members were onboard the AC-130; six survived the crash, seven tragically died, and one went missing.

The crash prompted a four-day search-and-rescue mission for the missing pilot. Ring and his unit took rotations flying search patterns during daylight hours, scanning the area in what ultimately proved an unsuccessful attempt to recover the airman.

"The search was facilitated by the loose-leaf booklet," said Ring. "It was the sole source of information to navigate safely while conducting this, or any other, mission."

#### SUPPORTING THE FLYERS

By 1999, nearly six years after deploying to Africa, Ring was employed by NIMA. He was assigned to the very office that had created the loose-leaf FLIP products he had relied upon so heavily during Operation Restore Hope and UNOSOM II. With a deep appreciation for how NGA aeronautical products facilitate mission accomplishment, even in the most uncertain of circumstances, Ring has been able to develop deeper subjectmatter expertise in the processes and technology that keep American and allied aircrews aware and safe in flight. He is now a branch chief in the NGA aero navigation office.

"It has been an incredible experience understanding the process our agency uses for taking even sparse source [content] from host nations and making sure that the information is validated and safe for our aircrews to fly worldwide, even in the most remote locations," said Ring. "It is also remarkable to watch as we streamline workflows by striving to modernize technology and develop coproduction efforts during this transition from legacy paper products to a data-centric environment."

The aero office will continue to focus on digital data into the future. Its team members are moving forward in finding ever better ways to provide NGA customers with mission-critical digital products and services. One example is the NGA aero app, according to Ring. In this app, an electronic 'flight bag' provides FLIP and can be displayed on a portable tablet. The app consolidates nearly 120 pounds of paper products into digital format and also allows for increased situational awareness and improved safety of navigation.

Ring is keenly aware that his career span reflects the range and development of NGA's aeronautical safety offerings. From paper FLIP for navigating the skies over Africa to an electronic flight bag app, NGA's aeronautical products, services and geospatial intelligence ensure that each aircrew, anywhere in the world, is equipped with the tools necessary for mission success. And who could be better to help lead the continued development of those tools than a former flight navigator who has relied on them himself?



# **INTEROPERABILITY:**

MANAGING THE CHALLENGE OF CONFLICTING PRIORITIES

By Chris Sullivan, NGA GEOINT Enterprise Office



#### At every given moment on every given day, America's

geospatial intelligence officers are on the lookout for anything in the world that might have the potential to affect our national security. While daunting, the task is made doable by collaboration through the U.S. government's National System for Geospatial Intelligence and its member status with Allied partners in the Allied System for Geospatial Intelligence. Missions provide a focal point and common reference for members of these communities to assess GEOINT needs. Geopolitics in the South China Sea is one example. This region is characterized by complex interactions between competing national interests, and physical and human geographies. The extensive, interrelated mission needs of the entire community must be understood to meet geopolitical and defense requirements across the region.

Concurrently, the community must maintain awareness of additional mission needs across the globe. Chief among them is monitoring the fight against the Islamic State in Iraq and Syria, and watching Russia's posture in Crimea. Also imperative is keeping an eye on humanitarian assistance in sub-Saharan West Africa and monitoring nuclear programs, including the detection of unsanctioned and illicit nuclear activities. Overarching is the requirement to stay current on adversaries' military doctrines and their capability to develop and launch theater ballistic missiles.

Collectively, these global GEOINT needs drive enterprise integration, relating directly to community members' mission readiness and collective response, and how the GEOINT enterprise meaningfully affects national security decisions.

Whereas mission needs are primary, they can also be unconstrained. Community members must make value trades—i.e., ranking requirements for precision and resolution, range of coverage, frequency of collections, etc. and mitigate risks that accompany the procurement of any large-scale, complex system.

"Eventually, we have to constrain user needs into affordable and technically feasible requirements," said Jeff Coleman, co-chair of the NSG future needs working group. "Our challenge is collecting and validating specific needs from our enterprise to answer our customers' toughest intel challenges, and then translating those needs into into required capabilites that acquisition agents can build to."

The community's move toward an open content paradigm adds an additional dimension to the user needs imperative. This paradigm entails the integration of georeferenced content from open and government-owned platforms, the latter including but not limited to the exquisite National Technical Means, or NTM, array.

Moreover, the integration occurs continuously in near real time, as processing and exploitation tools chew through data gathered throughout the day, every day of the year, across the spectrum of sensors. Community-wide adoption of the open content paradigm will generate GEOINT holdings that are current, dense, diverse, discoverable and high quality, available through common access and shared use.

"Rather than imaging a relatively small percentage of the earth each day, we need to think about ways to search and monitor all of it every day to identify changes in normal patters," said Andy Marotta, deputy division chief for GEOINT futures within the NGA GEOINT Enterprise Office.

Advanced analytics, such as structured observation management and object-based production, change how we measure GEOINT's value.

"Once change is detected, we focus on those sources and analytics that will most effectively and efficiently track, characterize and identify our most critical intelligence needs," Marotta said.

#### TRANSFORMING GEOINT

Transforming GEOINT into an integrated and persistent enterprise is among the GEOINT functional manager's most important roles. Advancements in technology and tradecraft put this transformation within reach. Positive changes are benefitting the community in the immediate term even while it plans for the longer haul.

#### **TODAY'S MEANS AND MISSION**

The GEOINT enterprise already has the technological means to create a more integrated architecture of interdependent government and private sector systems.

"Our industry partners' innovations and leadership help NGA and other members of the enterprise integrate and expand multilayer capabilities," said NGA Director Robert Cardillo, who serves as function manager of the GEOINT enterprise.

These capabilities include the exquisite NTM platform; commercial satellites, including small sats; and other airborne, ground-based and open sources. The digital revolution in data plays an integrative role as well, according to the U.S. Geospatial Intelligence Foundation's "2016 State of GEOINT Report." Collecting geographic source data on a nearly anytime, anywhere basis involves much more than highly capable overhead systems, according to the report's authors; it builds on many years of cartographic work that produces state-of-the-art geospatial data for maps and charts.

Technological advances are critical but insufficient to achieve persistence, which Cardillo defines as a change in mindset.

"Ubiquitous collection and common access allows us to go wherever the data exist; the change in mindset allows us to apply data wherever the mission demands," he said.

When analysts tackle an intelligence problem, their aim is to combine sources and methods in the best possible way to create insight and understanding for decision-makers. Because threats are dynamic and complex, and because those who want to do harm are agile and unpredictable, intelligence products can no longer be considered finished.

"We are shattering the boundary conditions that have always separated tasking, processing, exploitation and dissemination" said Marotta.

The interplay of means and mission is made productive through continuous feedback, collaboration and integration

among sensors, automated processors, advanced analytics and analytic models, according to Marotta.

#### ARCHITECTURE FOR THE FUTURE

Building this self-organizing, highly interdependent GEOINT enterprise takes a community-wide effort.

"Enterprise members are changing how they think about future capabilities," said Dustin Gard-Weiss, associate director for functional management and director of the NGA GEOINT Enterprise Office. "We envision a systems-of-systems architecture that emerges whole and integrated, with interoperability designed in, so that decision-makers receive a complete analytic picture with sufficient time to formulate a response and shift assets to execute the mission."

A deeper understanding of GEOINT needs and future capability requirements drives this endeavor. "Needs are the foundation upon which all capabilities are built," said Gard-Weiss.

Needs frame operational capabilities traceable to an organization's unique missions and functions, he added. A need is a capability required to meet a gap in an organization's current or future capabilities; a requirement is a validated need. Think of the distinction this way: To go about your daily business productively, you need to tell time. Wearing a watch meets that need; the features you value in a watch are the requirements.

The conversation about needs is broadly scoped; it has evolved from finely framed collection-driven requirements to consider the enterprise-wide capabilities that producers, users and enablers of GEOINT depend upon to carry out their missions.

"If we start with needs, we have confidence that we're building the right system; layering in community-validated requirements ensures we build the system right," said Jim McMahon, chief of the GEOINT futures division within the NGA GEOINT Enterprise Office.

With this aim of building the right systems, community members have come together to identify gaps, develop solutions, and understand the pros and cons of system architectures while they're still on the drawing table. This effort places needs at the forefront of capabilities development and programming, to capture, validate and prioritize needs from an enterprise perspective.

#### **ARTICULATING MISSION NEEDS**

Just as building the right system begins with needs, community members trace needs back to their unique missions which together advance national intelligence and military strategies.

"If we don't capture needs correctly, then there are multiple missions that won't be satisfied" said McMahon.

The GEOINT community's overarching needs are summarized in a new statement of needs document issued in March by Cardillo and his functional management team. The statement describes the role of GEOINT in solving the most vexing intelligence problems, with an expansive view of

potential solutions and a trajectory to develop and leverage capabilities as an enterprise.

The statement represents a community action agenda; community members shaped it through a series of engagements led by Cardillo's functional management team. The statement is intentionally unclassified in order to reach a wide audience across industry, academia, foreign partners, and of course the entire NSG.

Much as the NSG Strategy directs community effort toward three overarching priorities deemed most critical to building a unified enterprise, the new statement of needs focuses attention on those needs that must be met in order to convey anticipatory intelligence with high confidence.

"The statement captures what's at stake in making remotesensing architecture decisions, integrating commercial and foreign partners' data and advanced analytics in enterprise capabilities; and outmaneuvering our adversaries," said Gard-Weiss. "As the enterprise expands, new members of the GEOINT community can use it to forge more strategic and productive partnerships."

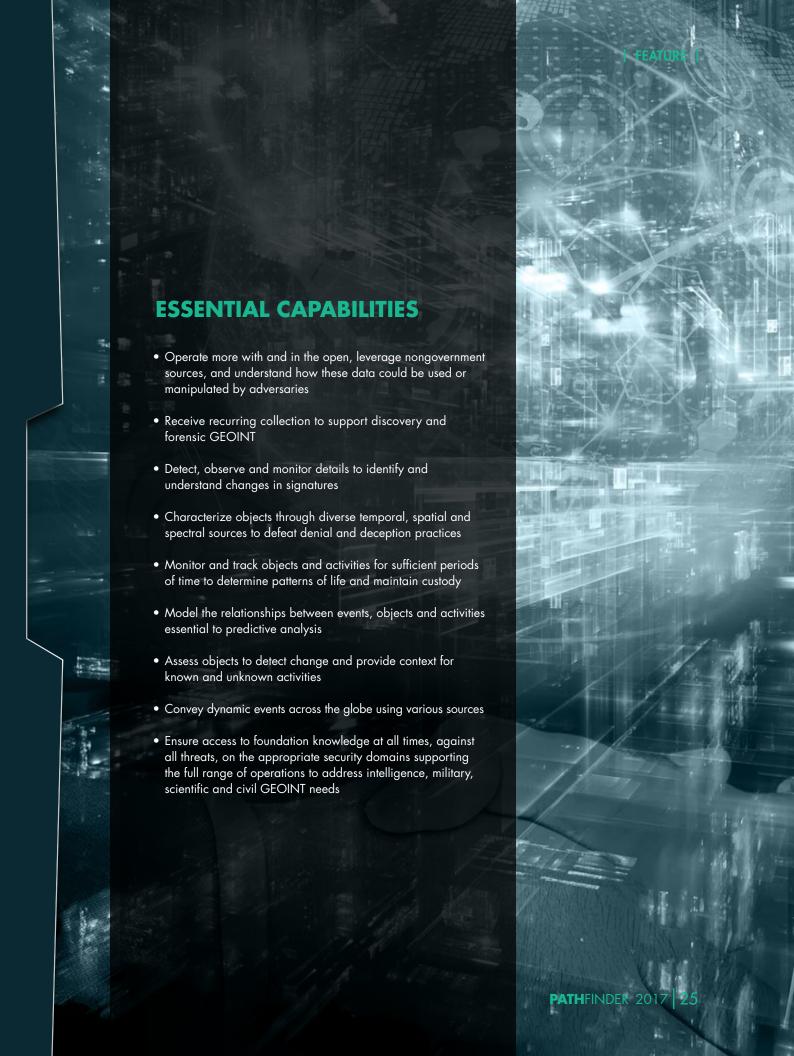
Setting an agenda through the NSG Strategy and articulating a common set of needs are only the first steps toward transforming GEOINT into an integrated and persistent architecture. An overarching enterprise capabilities document describes the GEOINT capabilities required to address these needs and gaps in the mid-2020 timeframe. The ECD is a product of the formal community governance processes used by the intelligence, defense and civilian agency communities; these processes ensure fair advocacy and unbiased assessment of requirements, and assure that dissenting views are represented and considered fully.

The ECD assesses the current state of the GEOINT Enterprise and examines various strategic drivers, including the geopolitical context and broad technological changes that demand greater agility, interoperability and integration. Enterprise members will rely on the ECD to conceptualize future GEOINT collectors and data providers and their ground-enabling components. They will also use it to make more specific acquisition-focused recommendations and establish lower-level requirements and specifications for systems and their components.

#### **FORMALIZING THE PROCESS**

As GEOINT functional manager, Cardillo is aggressively pursuing all opportunities to put user needs at the forefront of capabilities development and programming. His goal is a single, easy to use, easy to access process to gather, vet, validate and track satisfaction of needs. Only then can the enterprise reach its full GEOINT potential to: provide the contextual and temporal foundation to know the earth's geography and geodesy; enable safe navigation of the planet's waters, airspace and terrain; and provide the knowledge that tethers natural phenomena, manmade objects and human activities to time and space.

M. Karen Walker, Ctr., GEOINT Enterprise Office, contributed to this article.





By Mark Orsborn, Ctr., National Geospatial-Intelligence College





Just ask Dwight Dean, a National Geospatial-Intelligence Agency staff officer involved in training and developing the myriad professionals comprising the GEOINT community. Dean is one of several NGA professionals who support the National GEOINT Committee's training and professional development subcommittee.

"It is an exciting time to be here because there are limitless possibilities to advance GEOINT for our nation," said Dean.

NGA has experienced a tremendous amount of progress in its GEOINT capabilities in recent years, and the rapid advancement in technology is a catalyst of that growth, according to Dean. In a world that is becoming more digital by the minute, he notes that things are moving at a pace never seen before.

That is where the excitement comes into play.

"If we get the right group of people together, there are no limits to what they are capable of creating," said Dean.

NGA Director Robert Cardillo, who also leads the National System for Geospatial Intelligence, or NSG, as the functional manager for GEOINT, acknowledges just how much of a revolution is happening.

"We are living in the golden age of GEOINT, a time when our access to data and sources from across a variety of platforms is greater than before," Cardillo said during a recent National Intelligence University president's lecture series.

#### **EVOLVING TRADECRAFT**

The importance of being active drivers of GEOINT is something that Cardillo has long emphasized. He asserts that professionalization helps with the acceleration and proliferation of data and technology.

Business experts agree that keeping ahead of technology is important for long-term stability and growth. Organization and attention to detail are key components in sustaining that growth. To help with this, the National Geospatial-Intelligence College, commonly known as NGC, is working diligently to provide education and training solutions that keep up with demand and help lead the GEOINT tradecraft far into the future.

NGC's goal is to be a key player in the professionalization of the entire GEOINT enterprise. The first step in achieving that goal is to establish a set of core competencies that all GEOINT professionals must have to be successful in their profession. Standardizing those skills is important to instituting shared knowledge and adopting best practices, according to NGC Director Monique "Q" Yates. Agreements between internal and external customers will help build trust and grow the capabilities of GEOINT.

U.S. Army Chief Warrant Officer Thomas Dostie, who serves as chief of military services for NGA, is now on his third tour supporting the agency. He notes that advanced GEOINT capabilities have rapidly progressed in a short amount of time.

### WHY CERTIFY?

The professionalization and certification process helps organizations and its members in three key ways:

- 1. Increasing functional effectiveness —
  The effects of a collection of people is far greater than just one person. If members of an organization are certified in multiple functional areas, it will enhance qualifications and operational efficiency. It also increases knowledge sharing, problem solving and the creation of relevant policy. Professionalization guarantees the ability for manpower to surge, if necessary, for mission critical operations.
- 2. Furthering objectives of the profession —
  Certification helps document and track
  the knowledge, skills and abilities gained
  in every position. It tracks professional
  development from basic know-how to
  more complex material and even widens
  the range of transportable skills.
- 3. Creating professional mobility Establishing excellence through certification not only builds a professional cadre, but it provides them mobility to help advance their career. Having clear standards allows people to develop themselves appropriately and in line with their occupation.

"NGA and the entire NSG have achieved tremendous progress since transitioning from imagery intelligence and defense mapping days," Dostie said, making reference to NGA's founding as the National Imagery and Mapping Agency in 1996. NIMA was renamed NGA in 2004.

"[It's] nothing like a name change or simple evolution in time ... more a revolutionary advancement in technology, critical thinking and collaborative effort," he said. "GEOINT is the smallest intelligence discipline and provides the most bang for the buck ... quite a return on investment!"

#### **FINDING COMMON GROUND**

Given the progress achieved and the many security benefits GEOINT provides our nation and its allies, there is still room for greater optimization, varying lexicon and component-specific curriculum among NSG partners, according to Air Force Master Sgt. Justin Parker. He claims even better interoperability and communication can be achieved by increasing expertise and identifying best practices through training standards, certification and other professional initiatives.

"Communication is one of the biggest challenges we currently face," said Parker, who serves as the Air Force's GEOINT professional certification program manager.

Moving to a system where information is shared is very helpful in the overall mission, according to Parker. He said, "Agencies that have worked together before will have an even better understanding of each other and what each other does."

The Department of Defense is no stranger to partnerships, despite each component having a distinct mission. DOD is currently taking steps to identify and understand the needs of each of its components as it pertains to GEOINT certification.

In a related step, NGA's Cardillo, in his functional manager role, signed a memorandum in February 2016 that requires the entire DOD to identify and code billets requiring GEOINT certification. The memorandum also requires that all eligible candidates be certified in GEOINT professional certification — GPC — fundamentals by the end of calendar year 2017.

The GPC is the largest certification program in the intelligence community. GPC is managed by an independent program office within NGA created to support Cardillo in his role as GEOINT functional manager and all the components of the defense intelligence enterprise. GPC maintains the highest number of programs and people taking tests, as well as the largest amount of professionals with earned credentials. There are currently 11 certification programs within the GPC. Three of them are officially accredited by the National Commission for Certifying Agencies — GPC Fundamentals, Imagery Analysis and Aeronautical Analysis.

The February 2016 memorandum further stipulates that a GEOINT certification program with national accreditation across all components must be developed and implemented by the end of 2019; some individual components have established earlier suspense dates for their workforces.

#### **EXPANDING THE REACH**

Cardillo also stresses the importance of thinking of the GEOINT enterprise on a larger scale instead of through a microscope. He identified professionalization as one of the top three NSG priorities in the community's 2016 strategy. Several action items were established to help realize that commitment:

- Establish and sustain GEOINT education using shared curricula, training centers and instructors to expand cooperative learning opportunities.
- Employ certification across the NSG to create a trusted world-class workforce of GEOINT professionals with universally recognized skills.
- Adopt analytic modeling and support training to discover new objects, relationships or behaviors using object-based production and activity-based intelligence.
- Develop the next generation of GEOINT professionals with the talent and conviction to confront future security challenges.

Professionalization will play an important role in the maturation of the GEOINT enterprise, according to Yates. She believes the NGC is just beginning to scratch the surface.

"We are only experimenting with virtualized classes today," said Yates. "This capacity, once fully achieved, will allow us to host training anywhere and push materials virtually to multiple classrooms and people across the enterprise."

NGC is establishing partnerships around the globe to increase its scope and expand GEOINT training based on a core, shared mission. Those partnerships will lead to a more effective GEOINT enterprise capable of exceeding the challenges in front of it. The path ahead is indeed exciting, and what a better time to be here than now.

#### ENTERPRISE TRAINING COMMITTEE SETS SPECIFIC GOALS

NGA Director Robert Cardillo recently tapped National Geospatial-Intelligence College Director Monique "Q" Yates to co-chair the National GEOINT Committee' GEOINT training and professional development subcommittee, along with Colin Agee, senior advisor for intelligence community engagement, U.S. Army Intelligence.

Since being named as co-chair, Yates and her staff have secured agreements on nine training standards for GEOINT training and are expanding the college through a multitude of initiatives. Efforts are organized along the principles of leading, differentiating and brokering training.

# NGC will lead the way in making training accessible to the entire GEOINT enterprise through:

**Mobile training teams** — The MTT program delivers instruction in support of extended learning sites and provides onsite mobile training support to the NSG military, government and contract employees at their home locations. NGC utilizes adjunct professors to help meet the amount of requests received at any given time. If there is no training offered at a specific location, students can search an online database for an MTT course in a different location that may be close to their facility.

**Web-based training** — NGC offers web-based training in an effort to increase accessibility of training to students. The MTT program moved a portion of relevant curriculum to the World Wide Web to help alleviate the workload of its instructors. In addition, external training through the educational platform Blackboard offers an array of courses customers can access both in the office and at home.

**Learning Advisory Board** — The NGA LAB enhances cross-organizational support for addressing strategic workforce learning needs in the rapidly evolving GEOINT environment. NGC is increasing participation for international and NSG partners to help scope those needs.

# NGC will broker the relationship between curricula needed and external partner contributions through:

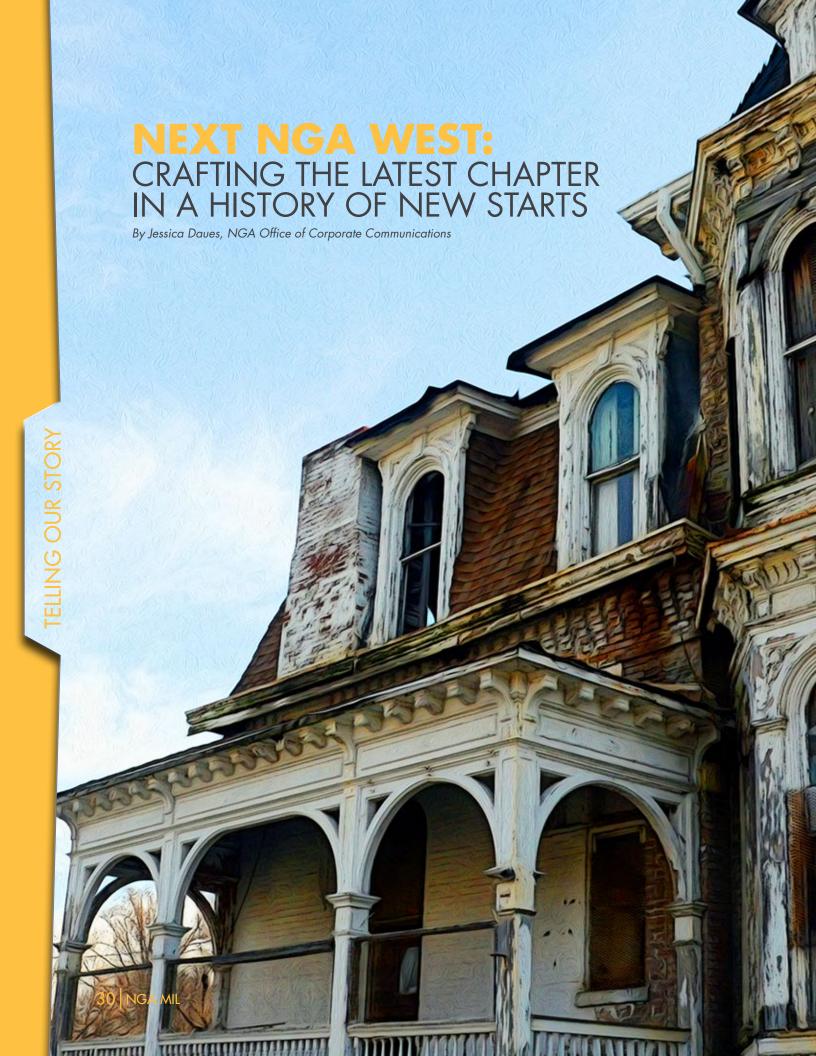
**Curriculum implementation** — NGC is making investments to create learning opportunities that are current, engaging and accessible to the entire GEOINT enterprise. If during that process the NGC finds a third-party curriculum that is a better use of resources, it will be adopted and implemented in lieu of developing training from the start.

**Partnerships** — Partnerships with different communities and organizations are a critical component for sustaining the long-term development of the workforce. NGC is enhancing its outreach and engagement with the IC, DOD and international partners, as well as with the commercial and academic sectors.

# NGC will differentiate itself to either lead or broker in order to create value for its customers through:

**Resource allocation** — As NGC continues to grow and develop its training curriculum, it also focuses on proper resource distribution. For instance, because the NGC receives more MTT requests than it can meet, it has criteria to prioritize the delivery of that training. One of the options inside of the differentiate model is to move some courses to a web-based format, allowing broader customer base access.

**Strategic investment** — Understanding the ability to say "no" is important when determining where to apply resources. NGC identifies areas to reduce efforts in order to be able to provide the best possible product. In the case of the Program of Study for Advanced Geospatial Analysis, for instance, NGC realized the program was a wise choice for divestment based on relative performance and importance. As a result, NGC refined its investment in the program and retained a percentage of the courses that best meet the needs of its customers.



The story of St. Louis Place is written in the language of hope and opportunity. Part of it is told in Native American dialect, other parts in French, German or Polish. Some details are conveyed with an Irish brogue and the most recent ones with a soulful African-American lilt.

The area that will become the National Geospatial-Intelligence Agency's future St. Louis campus has been home to many diverse populations over the decades. Just like NGA, previous residents came to start a new chapter in their life story. The area was first settled by French farmers. Next came German and Irish craftsmen, entrepreneurs and laborers. Later, African-American families formed their own communities in the neighborhood.

When NGA moves into its new campus at the site, the agency will become part of the newest chapter of the North St. Louis neighborhood's history. It's a history that not surprisingly is rooted in Native American culture.

The first occupants of St. Louis Place didn't actually live there but instead pitched the occasional Native American small hunting camp, said Joe Harl, an archaeologist leading the excavation of the NGA site.

Back then the site was open prairie. "It's about a mile from the nearest water source, and they [Native Americans] preferred wooded areas to make homes and burn fire," Harl said. The prairie provided good hunting, though; especially for larger animals such as bison.

Harl said the first permanent residents of what would become St. Louis Place were French farmers in the 1760s, when much of North America was claimed as New France. The future NGA site was used as a common field; families who lived there were assigned long tracts of the land to farm. France sold St. Louis to the United States as part of the Louisiana Purchase in 1803.

The NGA site, located about two miles northwest of the heart of St. Louis,

remained rural until the 1840s, when workers arrived to dig dirt and stones to build a reservoir nearby, Harl said. With the reservoir completed in 1850, workers continued to quarry the site for limestone and clay to make bricks. The city annexed the St. Louis Place neighborhood in 1855, and portions of St. Louis Place were subdivided and sold to individuals to build homes and businesses.

The streets near St. Louis Place Park, just northwest of the future NGA site, became a fashionable destination for the mansions of wealthy, self-made businessmen and bankers, especially of Irish and German descent, in the 1870s, '80s and '90s.

As the mansions went up, quarries were filled in. More modest homes and apartments for middle-class and working-class immigrants and first-generation Americans were built on top of the clay pits.

"There were a lot of Germans, but also Irish, Polish ... the north side was a melting pot," said St. Louis historian Ruth Keenoy. "The neighborhood was mostly residential, with schools, churches. People with neighborhood businesses — such as cleaners, bakeries, markets — probably lived above their businesses."

As more and more people moved in, St. Louis Place became an intellectual and cultural center, especially for the area's German community.

The Homeopathic Medical College of Missouri, which was located on the west side of the NGA site, became one of the first American medical institutions to grant degrees to women in 1874. The German Free-Thinkers Hall, located northeast of the NGA site, established a 3,000-book library in 1876, a time before public libraries. In 1893, German immigrant Clemens Strassberger opened a music conservatory, which expanded to multiple locations and eventually boasted 1,148 students.

But the character of St. Louis Place, like much of the city, changed after World War II, Keenoy said.

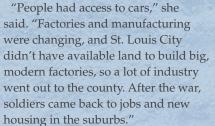
## NGA TO BUILD NEW FACILITY IN NORTH ST. LOUIS

Last spring, NGA announced it would build a new facility in the St. Louis Place neighborhood in North St. Louis. The new facility is slated to open by 2023 and will replace the NGA campus in South St. Louis at Second Street.



St. Louis Place once supplied the community with limestone and clay for making bricks

NGA selected the St. Louis Place site because of its central location and close proximity to leading universities, technology hubs and businesses. NGA's hope is that the new campus will facilitate closer collaboration with colleagues in academia and industry.



As the immigrant residents left, a new population moved in, also seeking opportunity — the chance to purchase

"St. Louis didn't have

fair housing laws

their own homes.

1968, and until then, deed restrictions often prevented houses in certain areas from being sold or rented to black families," Keenoy said. She noted that St. Louis Place was attractive to these first-time homeowners, because it was close to several areas where they previously had been restricted to living.

Lois Laster's family moved into the neighborhood just west of the NGA site

in 1945, when she was 5-yearsold. She was among the first African-American children to integrate the local Catholic

school,

St. Leo's, which was located at the southern end of the NGA site.

Laster remembers growing up in a lively, mixed neighborhood where neighbors looked out for one another.

"The streets were safe," she said. "People didn't have air conditioning, so we would leave the front door open and make a pallet and sleep by the front door. I did that all the time."

Laster said the neighborhood had every convenience. For instance, she remembers four movie theatres within walking distance of her home.

"We walked everywhere," Laster said. "All the stores and shops you needed were right there in the neighborhood: bakeries, cleaners, shoe shops, hardware stores."

After three decades, however, conditions began to change. By the late 1970s, the community began to

lose access to health care, jobs and shopping, Keenoy said.

"According to some people we interviewed, crime began to go up; businesses would get robbed, and they either closed or moved out," Keenoy said. "More factory jobs moved to the county. People began to move out, and nobody moved back in, leaving houses vacant."

Gradually, houses and businesses in

St. Louis Place were demolished, and few new ones were constructed, leaving blocks of grass lots. In some ways, the area had the appearance of going full-circle back to its beginning as open prairie.

Over the past 10 years, St. Louis Place has become a quiet area, according to Keenoy, with residents who are engaged in the neighborhood. In 2002, Laster began organizing an annual reunion for people who lived in and near the new NGA site. The reunions have drawn 300 to 400 people, some from as far away as California, Ohio and Michigan.

As NGA prepares to become the newest resident of St. Louis Place, the agency will seek to become a good neighbor and inject energy back into the once-bustling area.

"Our Next NGA West program team feels a great deal of responsibility to respect the neighborhood with our presence and to be a source of pride for the community," said Susan Pollmann, director for the Next NGA West program.

"Director Cardillo decided on this location because it was best suited to our future mission, but we hope NGA's presence will give back to the area in terms of spurring development," Pollmann said. "Our team looks forward to helping the people of St. Louis Place and surrounding neighborhoods get to know NGA better in the coming months and years through our outreach to local groups and schools."

As NGA, the future government resident of St. Louis Place, prepares to move in, the language of hope and opportunity rings loud and clear.

#### PASS IT ON!

Do you know an interesting history of an NGA program or GEOINT-related topic? Share it for posterity by sending your write-up to: Pathfinder@nga.mil. All submissions subject to editing.

# COLD WAR-ERA SATELLITE IMAGES REVEAL MODERN-DAY GROUND TRUTH

By Victoria Piccoli, Ctr., Office of Corporate Communications

They have helped archaeologists identify ancient ruins and anthropologists see how 20th-century urbanization has changed agriculture. The half-century-old satellite images were intended for a far different purpose, however; to capture insight into the Soviet Union's strategic capabilities during the Cold War.

"Following World War II, the United States became concerned about the goals and intentions of its former wartime ally, the Soviet Union," said Jim Mohan, director of the National Geospatial-Intelligence Agency's museum. "The Soviet Union proved a hard target to penetrate by conventional spying methods."

The United States grew particularly concerned after the Soviet Union launched Sputnik I and II, followed by the successful test launch of intercontinental ballistic missiles.

"American leaders wanted specific information on Soviet military strength, especially the number of Soviet long-range bombers and intercontinental ballistic missiles," said Mohan. "While the West had plenty of spies operating in Moscow, the view from overhead provided the knowledge of Soviet strategic capabilities."

Since then, the images have been declassified and have provided researchers with their first high-resolution look at many parts of the world. In addition to assisting archaeologists and anthropologists, the images have proved valuable to glaciologists, who have used them to track Antarctica's melting ice sheets. Now maintained and available at the National Archives and Records Administration in College Park, Maryland, the original film and technical documents are enabling scientists of all types to study how the earth has changed due to urbanization, acts of war and changing climate conditions.

#### A 'STABILIZING' FACTOR

The first acknowledgement of the reconnaissance imagery was tucked into President Jimmy Carter's Oct. 1, 1978 speech at the Kennedy Space Center, touting the American space program.

"Photoreconnaissance satellites have become an important stabilizing factor in world affairs in the monitoring of arms control agreements," said Carter. "They make an immense contribution to the security of all nations. We shall continue to develop them."

The United States had collected thousands of photos long before Carter openly recognized the secret satellite operations. President Dwight Eisenhower had approved the program's development in 1958, under the guise of the initial Discoverer space missions. The first satellite



First Imagery Taken By CORONA - Mys Shmidta Air Field, USSR August 18, 1960

was approved for launch in 1960, after the downing of Central Intelligence Agency pilot Gary Power's U-2 plane. (See related story, page 4.)

From 1960 to 1986, the top-secret Keyhole satellite program and its multiple satellites Corona KH1-5, Gambit KH6-7 and

Hexagon KH8-9 — captured overhead images that provided insight into the Soviet Union's strategic capabilities. The development of reconnaissance satellites in space provided a different vantage point for the United States to gather intelligence on parts of the world that were once off-limits to traditional reconnaissance methods.

"During the Cold War, the KH satellites revealed not only military strength but also Soviet supply reserves, status and condition of their industrial sites," said Mohan.

Through photo interpretation, U.S. intelligence analysts were able to count the numbers of Soviet troops, tanks, aircraft and missiles with a high degree of confidence, all while ensuring and monitoring current negotiations and arms control treaties.

The confidence in what eventually became known as geospatial intelligence supported negotiations around the Strategic Arms Limitation Treaty and the Mutual and Balanced Force Reductions negotiations with the Soviet Union. These negotiations were driven by data and information U.S. policymakers gained from the Corona, Gambit and Hexagon satellites.

"It's amazing what we got out of the imagery back then," said Kemp Lear, a former government analyst who used KH-8 and KH-9 imagery to monitor the Soviet Union. "It was important to see what they were doing with missiles and submarines, and if they had the capability to launch ballistic missiles."

The satellite programs also informed the 1961 National Intelligence Estimate, which reduced the U.S. estimate of the number of current and future intercontinental ballistic missile launchers the Soviets had and would possibility

build. Seven years later, the new data from satellite photoreconnaissance allowed the estimate in 1968 to reflect an increase in confidence of U.S. satellites, the intelligence community's imagery analysis and national security.

"It was interesting. It was a time of a lot of concern. But, it was also a great time for imagery as an intelligence source," said Lear.

#### A DIFFERENT KIND OF INTELLIGENCE

As years passed and technology advanced, the once invaluable Corona, Gambit, and Hexagon satellites systems were deemed technologically irrelevant for military intelligence. In 1970 an NGA predecessor agency, the National Photographic Interpretation Center — a joint project of the Department of Defense and the CIA — recognized the potential usefulness of the satellite imagery for mineral resources exploration. Used to create photographic maps, the satellite imagery enabled geologists to search for various deposits, the most prominent of which was petroleum.



Dolon Air Field, USSR - Selected heavy bombers compared with selected transport aircraft August 20, 1966

In 1995, President Bill Clinton ordered the release of certain scientifically or environmentally useful imagery acquired by spacebased national intelligence reconnaissance systems. Vice President Albert Gore was a key proponent, recognizing that satellite imagery "recorded...much more than the landscape of the Cold War."

"In the process of acquiring this priceless data, we recorded for future generations the environmental history of the earth," said Gore.

The last images from the Cold War program yet to be declassified are those from the KH-8, which are expected to be released soon.\*\*

See actual Corona and Gambit satellites that were used for this work on display at the National Smithsonian Institution in Washington, D.C.

## **STEWARDSHIP OF NGA'S RESOURCES:**

### TAKING CARE OF BUSINESS AT THE ENTERPRISE LEVEL

By Amelia Cohen-Levy, Office of Corporate Assessment and Program Evaluation

Assessment and evaluation functions are hardly new to government. In the early 20th century, the United States began to dedicate more effort to understanding its resources and using them wisely.

Enterprise-level assessments were seen during World War I and the Great Depression, and were formalized by the military during World War II. They are what made it possible for the nation's leaders to determine what was needed, where to send it and how much effort and time it would take to create it — an overarching decision process that would inform war efforts in every theater as well as at home.

That perspective is intertwined with the National Geospatial-Intelligence Agency's duty to know the earth and to do so by effectively balancing needs and resources all across the globe. The same thinking led NGA to form the Office of Corporate Assessment and Program Evaluation earlier this year.

NGA's CAPE reports directly to the agency's deputy director, Sue Gordon, giving the team access across organizations and creating a greater sense of alignment.

"By collaborating across the enterprise, CAPE can conduct business across boundaries, build networks to better understand customer sentiment, integrate best practices, and ultimately, answer NGA's hardest questions," Gordon said. "In every interaction, CAPE will champion a culture of commitment to and investment in NGA's future, making sure that the intentions of yesterday are reflected in the choices of tomorrow."

It is precisely that clarity CAPE looks to provide when it conducts independent assessments and evaluations. These can take different forms: cost estimates for a new program, resource analysis for a current project or identification of new areas for exploration. By using these studies to make better decisions, NGA can address areas of concern head-on and deliver better value to its customers.

To make that happen, CAPE's director, Christy Monaco, plans to expand support into a number of areas, including the program evaluation community across the Department of Defense, the intelligence community and industry.

"...[W]e see opportunity not only in conducting datacentric and independent analysis of NGA programs, but also in looking at how the broader GEOINT enterprise is poised to meet customer needs," Monaco said.

Andrew Vance, one of CAPE's business analytics officers, believes that by integrating enterprise analytics, CAPE can help NGA content owners understand how

GEOINT customers use and feel about NGA products. This understanding, he believes, creates the foundation for a relationship that can endure as well as evolve.

How the CAPE team accomplishes that is another matter.

"We are working to develop a consistent set of business insights that drive efficiencies, support fulfillment of customer demand and prioritize resources," Vance said. "By being above the fray, we can help bring a global understanding to strategic decision-makers as well as to each stakeholder."

That sense of independence, of being nonbiased and without an agenda, makes CAPE an important resource for NGA. It also provides the agency's employees with a potential career-broadening opportunity — the chance to serve on an enterprise-level team.

Diane Rice, the CAPE deputy director, believes that everyone should have the chance to do a rotation in CAPE, especially if they are going to be an agency leader.

"I was very lucky to have the opportunity to move from SI [the Security & Installations directorate] to CAPE," Rice said. "It was enlightening to get the broader agency strategic perspective and the experience of working closely with the agency front office. My goal is to make CAPE a place where any employee can have that experience."

While the CAPE team is not involved in the day-to-day workings of any of the NGA key components, its members are nevertheless taking care of business on a daily basis. The goal is to prioritize NGA's budgetary resources and align the agency's work with congressional direction.

That's an ongoing task, according to Claire Ayhan, a policy officer in CAPE's planning and programming assessment division.

"The utility of CAPE is the ability to use an outsider perspective to find efficiencies, optimizations and things that may have been overlooked. These are the kinds of things that seem simple but have big impact," Ayhan said.

Most projects are never really finished. Once the planning phase ends, the program itself has to be assessed as it is executed to make sure it stays on track. Then, just when it seems like the program is wrapping up, Ayhan says, the next year's activities begin. She says the goal in the continuous-improvement cycle is to use lessons learned to ensure that everything is ready for the next year.

"If we do our job correctly, we can lift the agency to its greatest possible achievements," Ayhan said.

## **CROSS-AGENCY TEAMWORK EARNS PRAISE FOR MODERNIZING CLASSIFICATION GUIDANCE**

By Paul Kieschnick, NGA Senior Classification Manager

A new classification guide for geospatial intelligence product development is being hailed by the office of the director of national intelligence as "a possible model for how to achieve transformation, for the IC and nationally."

The Consolidated NGA Security Classification Guide, referred to here as SCG for the sake of simplicity, reduces the redundancy of previous classification guidelines in response to the Fundamental Classification Guide Review and Reduction of Over-Classification Act enacted in 2010. It consolidates 65 individual National Geospatial-Intelligence Agency classification guides into a single source, while validating classification content with the agency's current mission and functions. A new security management resource tool, known as SMaRT, provides an online, searchable version of the SCG that provides users greater access and availability of classified guidance.

A team of 30 active participants from across NGA developed the SCG to comply with the Department of Defense and director of national intelligence requirements to eliminate redundancy and support ease of use. Within the team, four smaller integrated product teams — focused on the validation of content, second-level vetting for quality, management concurrence, and software coding and implementation — used an agile process to develop the updated guide in less than six months.

The SCG will modernize the content of NGA's protected information to reflect 21st-century, dynamic military operations and the proliferation of open sources and methods. The SCG includes an 82 percent reduction in secrecy due to the removal of redundant line items. It also

includes more than 40 classification downgrades, more than 360 revised line items and completely eliminates the use of 'for official use only' and 'confidential' classification terminology.

Another innovative feature of the new SCG is that three 'enhancement statements' are included for each classified line item. These three statements are: value, damage and unclassified. The value statement explains why the information is being protected. The damage statement describes the potential impact to national security should an unauthorized disclosure occur. The unclassified statement outlines how a user can address a classified line item in an unclassified manner.

SMaRT provides an agile online resource for information classification. It features multiple search, sort and filter parameters, and a rapid change process to provide current GEOINT classification to users of GEOINT. It also provides quick access to a glossary of common GEOINT acronyms and definitions.

SCG has been designed to be agile, based on the evolution of information and mission needs; empower analysts to develop GEOINT products at the appropriate classification level for consumers; build a security classification operating framework that enables agile and adaptive GEOINT; and a focus on classifying GEOINT products at the lowest appropriate classification for the greatest distribution.

The SCG is setting the scene to enable greater analytical and general user risk management, by delivering clear and concise classification guidance to GEOINT producers and users, making the complex task of accurate derivative classification simpler and easier to do.\*\*

## **FUNCTIONAL MANAGEMENT AUTHORITY**

NGA is leading the defense and intelligence communities in classification management transformation by fully embracing the principles of fewer, simpler classification guides and better derivative classification decisions across the National System for Geospatial Intelligence. By DOD authority, NGA Director Robert Cardillo exercises functional management authority over geospatial intelligence, including general classification guidance. Individual 'original classification authorities' retain coanizant add/ change/delete authority over specific line items. The NSG community can access the new SCG via the C2S cloud.



A document signed Aug. 14, 1941 off the coast of Newfoundland by President Franklin Delano Roosevelt and British Prime Minister Winston Churchill outlined mutual aims to counter Axis aggression and articulated a joint vision for post-war solidarity.

That document, the Atlantic Charter, presented a set of common principles to sustain the special relationship between the United States and United Kingdom long after the war. The charter and its principles provided a foundation for security agreements between the two nations, extending to the other principal U.K. commonwealth nations, that remain as important today as they were then.

An especially close intelligence-sharing alliance evolved with the U.K., Canada, Australia and New Zealand, who, along with the United States, are often referred to as the FVEYs — "Five Eyes" — partners. The FVEYs are committed to providing their respective defense forces, national decision-makers, and each other with responsive and timely intelligence to meet individual and collective national security needs. The members strive to enhance collective national security through an

enduring, integrated and optimized allied defense intelligence enterprise.

The geospatial intelligence discipline plays a critical role in defense intelligence. GEOINT provides means to safely navigate the planet's waters, airspace and terrain, and precisely reference objects on the earth and in space. It assists in better anticipating future activities and discovering new relationships. It enables us to uncover unknowns about our environment and threats to national security.

Recognizing that sharing and coproducing GEOINT are necessary to convey anticipatory intelligence with high confidence, the FVEYs created the Allied System for Geospatial-Intelligence — ASG — in 2009 to enhance coordination and integration of their respective GEOINT enterprises.

"NGA works to drive the ASG to leverage capabilities for the common good of the enterprise," said Charles Meyer, who leads ASG community governance as a member of the NGA GEOINT Enterprise Office. "Resources are shared amongst the partners to find solutions to the challenges each country might be facing."

Functional and mission management are the building blocks of the ASG. The structure, guidelines, initiatives and plans set out by the ASG have become examples for other governing bodies within the larger GEOINT enterprise. Working together, the FVEY partners provide each other global, regional and civil GEOINT support through shared resources. The arrangement enables the partners to collectively overcome challenges relating to professional talent, data overload, technical requirements and complex threats.

#### **WORKING FOR THE COMMON GOOD**

Mission management involves learning through trust, showing progress and conducting pilot projects that produce results for the common good of all partners. It also involves sharing each other's resources when in need, not only for combat support but also to respond to global crises.

The ASG Operations Coordination Cell is one way that ASG members find efficiencies through missionsharing and collaboration. Manned by representatives from NGA, the Australian Geospatial-Intelligence Organisation, Canadian Forces Joint Imagery Centre, GEOINT New Zealand and the U.K. National Centre for Geospatial Intelligence, the AOCC synchs operational activity with mission managers and team leads across the ASG. Its members conduct full foundation GEOINT assessments of products and services, develop

repeatable processes to discover content and format reports for common use.

The Ebola crisis in Africa demonstrated how well the FVEYs work together toward a common cause. AOCC products applied in-depth knowledge of the earth and its features to analyze travel times from capital cities to neighboring countries, while factoring in the resilience of the affected communities. Senior decision-makers received easy-tounderstand, unclassified graphics tailored to their needs.

"This type of commonsense collaboration needs to become our norm," said Jane Dickerson, chief of NGA's International NGA Support Team in Europe.

Mission management also helps ensure shared situational awareness among allies when coordinating efforts on the ground, as is required during significant events, not just during times of crisis. For instance, the world comes together every two years to watch its greatest athletes strive to take home gold medals for their countries at the Olympics. It is not an easy endeavor for the athletes, nor is it for the host country or the governments responsible for the welfare of their athletes. To meet the myriad challenges and increase efficiency, the AOCC created a joint Olympics support team to serve the FVEY community. Each of the five organizations contributes manpower and shares access to analytic products across the ASG.

#### **BUILDING TOWARD INTEROPERABILITY**

The AOCC exemplifies a new type of FVEY partnership. Typical collaboration in the past involved two or three ASG members who agreed to jointly address an issue of common concern or develop a shared capability. These transactional agreements were beneficial to the individual parties but made only incremental steps toward an interoperable ASG enterprise.

"We want to move away from being stovepipe and have more flexibility

in our governance and solutions," said Col. Anthony Crook, Senior U.K. liaison to NGA.

Strategically collaborating allows individual partners to leverage their unique contributions of the enterprise, leading the way in developing capabilities for the benefit of all. Partners are encouraged to define problems in the same way and develop common approaches to problem-solving. Solutions are more easily replicated to fit the needs of all partners as a result.

At an ASG meeting in May 2016, NGA Director Robert Cardillo, who serves as the functional manager for the GEOINT enterprise, encouraged his counterparts to accelerate progress toward an interoperable GEOINT enterprise. ASG members ran with the challenge, and they are now working through their official forums and associated working groups to achieve three priorities: enhance the GEOINT profession; create a common allied GEOINT environment; and enhance mission sharing — that is to integrate tasking, collection and production of GEOINT. ASG members have since adopted a five-year strategy and are developing implementation plans with milestones, allowing the leadership group to measure the ASG's progress as a holistic enterprise.

"The ASG's strategy advances an overarching aim of the enterprise, to expand the sphere of GEOINT," said Dustin Gard-Weiss, associate functional manager and director of the NGA GEOINT Enterprise Office.

Expanding GEOINT means working with nontraditional sources of information, welcoming new contributors and giving GEOINT professionals greater mobility and a broader perspective, Gard-Weiss explained.

"The ASG is doing its part to keep GEOINT at the forefront of the intelligence and warfighting missions," he said.



# SMALL-SAT IMAGERY GIVES INTERNATIONAL PARTNERS SHARED SITUATIONAL AWARENESS

Technological advances, the increased availability of commercial satellite imagery and broad sharing agreements make it easier and more efficient than ever for international partners to collaborate, especially during times of disaster response or humanitarian crisis.

One commercial imagery provider, Planet, designs, builds and operates the world's largest constellation of Earthimaging nano-satellites that deliver multispectral imagery at 3.5 meter resolution. In July 2015 Planet acquired the five satellite, 6.7 meter resolution RapidEye constellation from BlackBridge Corp. Planet's products include unrectified and orthorectified images and orthomosaic single-pass tiles. Through an introductory contract with the National Geospatial-Intelligence Agency signed in early fall 2016, the Planet Feed is utilized across the National System for Geospatial Intelligence — NSG — and by select members of the civil federal community.

In fall 2016 the worst flooding in over two decades devastated farming communities in New South Wales, Australia. Approximately 1,000 people had to evacuate, crops were severely flooded and thousands of cattle had to be relocated to safer areas until floodwaters receded. In accordance with the International Charter for Space and Major Disasters, Planet provided RapidEye imagery of observed flooding within 18 hours of Australia's request for imagery, shown here. The imagery was used to quickly create flood maps that assisted with relief efforts.

To learn more about NGA's numerous commercial partner relationships, visit http://www.nga.mil